For Problems T13–T16, sketch the indicated transformations on copies of Figure 1-8o. Describe the transformations.

T13. $y = \frac{1}{2}f(x)$

T14. $y = f\left(\frac{2}{3}x\right)$

T15. $y = f(x + 3) - 4$

T16. The inverse relation of $f(x)$

T17. Explain why the inverse relation in Problem T16 is not a function.

T18. Let $f(x) = \sqrt{x}$. Let $g(x) = x^2 - 4$. Find $f(g(3))$. Find $g(f(3))$. Explain why $f(g(1))$ is not a real number, even though $g(1)$ is a real number.

T19. Use the absolute value function to write a single equation for the discontinuous function graphed in Figure 1-8p. Check your answer by plotting it on your grapher.

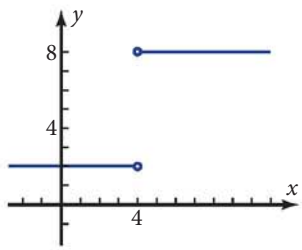

Figure 1-8p

T20. Plot these parametric equations on graph paper, using each integer value of t from -3 to 3. Confirm the results by plotting them on your grapher. Is y a function of x? Explain.

$$x = t + 4$$

$$y = 1 + |4 - t^2|$$

Wild Oats Problem: Problems T21–T28 refer to the competition of wild oats, a kind of weed, with the wheat crop. Based on data in A. C. Madgett's book *Applications of Mathematics: A Nationwide Survey,* the percent loss in wheat crop, $L(x)$, is approximately

$$L(x) = 3.2x^{0.52}$$

where x is the number of wild oat plants per square meter of land.

T21. Describe how $L(x)$ varies with x. What kind of function is L?

T22. Find $L(150)$. Explain verbally what this number means.

T23. Suppose the wheat crop is reduced to 60% of what it would be without the wild oats. How many wild oats per square meter are there?

T24. Let $y = L(x)$. Find an equation for $y = L^{-1}(x)$. For what kind of calculations would the equation $y = L^{-1}(x)$ be more useful than $y = L(x)$?

T25. Find $L^{-1}(100)$. Explain its real-world meaning.

T26. Based on your answer to Problem T25, what would be a reasonable domain and range for L?

T27. Plot $f_1(x) = L(x)$ and $f_2(x) = L^{-1}(x)$ on the same screen. Use equal scales for the two axes. Use the domain and range from Problem T25. Sketch the results along with the line $y = x$.

T28. How can you tell that the inverse relation is a function?

T29. What did you learn as a result of taking this test that you didn't know before?